UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

COREPHOTONICS, LTD.,

Plaintiff,

v.

APPLE INC.,

Defendant.

Case No. 3:17-cv-06457-JD (lead case)
Case No. 5:18-cv-02555-JD

SUPPLEMENTAL DECLARATION OF DR. FRÉDO DURAND IN SUPPORT OF APPLE INC.'S PROPOSED CLAIM CONSTRUCTIONS

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I, Frédo Durand, declare and state as follows:

1. I submit this declaration regarding certain claim terms recited in U.S. Patent No. 9,185,291 ("'291 Patent"), as a supplement to the declaration I previously submitted in this matter dated October 13, 2022. Except as set forth herein, I maintain and incorporate by reference the contents of my prior declaration.

I. INTRODUCTION AND OVERVIEW

2. I have been provided with the following additional legal principles beyond those set forth in my October 13, 2022 declaration.

3. I understand that, under 35 U.S.C. §112(f), "[a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. §112(f). I understand that where a claim term lacks the word "means," there is a presumption that §112(f) does not apply. I understand that to rebut this presumption, the challenger must demonstrate that the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function. I understand that the patent's specification may be relevant in evaluating the meaning of the claim term as part of the inquiry as to whether the term recites sufficiently definite structure or else recites function without reciting sufficient structure for performing that function.

4. I understand that where a claim element is subject to 35 U.S.C. §112(f), it is construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof. I understand that where the function is implemented by a general-purpose computer or processor that implements a disclosed algorithm for performing that function, the corresponding structure includes that algorithm.

5. I have been asked to evaluate certain issues relating to the following element of claim 1 of the '291 patent: "a camera controller operatively coupled to the Wide and Tele imaging sections, the camera controller configured to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of

view and to provide without fusion continuous zoom video mode output images of the object or scene, each output image having a respective output resolution, wherein the video output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa, wherein at the lower ZF value the output resolution is determined by the Wide sensor, and wherein at the higher ZF value the output resolution is determined by the Tele sensor."

6. I have been asked to evaluate whether this "camera controller" element recites sufficiently definite structure or else recites function without reciting sufficient structure for performing that function. In my opinion, the "camera controller" element recites function without reciting sufficient structure for performing that function, as discussed further below.

7. I have also been asked to evaluate the corresponding structure for the "camera controller" element in the '291 patent specification. I provide my opinion on this issue below.

8. I have also been asked to address the Office Action dated December 22, 2022 in the reexamination of the '291 patent ("Office Action") and the Supplemental Declaration of John C. Hart Regarding Claim Construction dated July 10, 2023 ("Supplemental Hart Declaration"), which I address in my discussion below.

II. EVALUATION OF "CAMERA CONTROLLER" CLAIM ELEMENT

9. Based on my review, the "camera controller" element recites function without reciting sufficient structure for performing that function and therefore should be interpreted as a means-plus-function element.

10. To evaluate the meaning of the term "camera controller" in the context of the '291 patent and claim 1, I have reviewed the specification of the '291 patent. The specification teaches that the term "controller" is used as a label for a group of functions called a "camera fusion processing core" that is referenced at item 114 in the specification. The specification introduces the term "controller" in this way: "Camera 100 further comprises a **camera fusion processing core (also referred to as 'controller')** 114 that includes a sensor control module 116, a user control module 118, a video processing module 126 and a capture processing module 128, all operationally coupled to sensor control block 110." '291 Patent, 6:10-15 (emphasis added). I note that the

Supplemental Hart Declaration concurs that "camera controller 114" corresponds to the "camera fusion processor core" in the '291 patent specification. Supplemental Hart Declaration, ¶ 18.

11. Figure 1A of the specification shows the "Camera Controller 114" as follows:

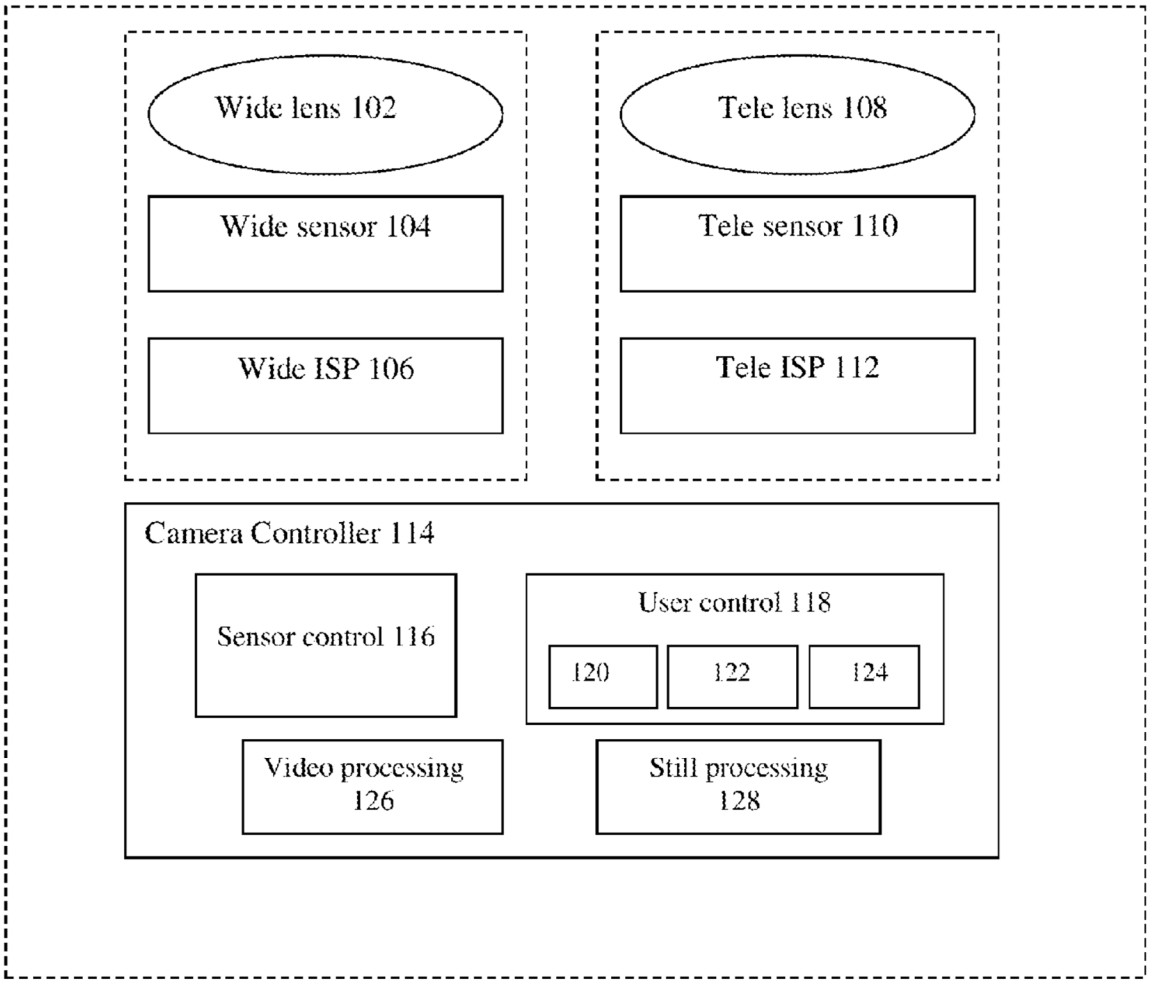


FIG. 1A

12. As stated in the text of the specification and shown in Figure 1A, the camera fusion processing core, also labeled as "Camera Controller 114," comprises functional blocks each labeled as a "module," including "a sensor control module 116, a user control module 118, a video processing module 126, and a capture processing module 128." '291 Patent, 6:10-15, Fig. 1A.

13. Based on my review, the specification never describes that the camera controller 114 or the modules inside it have any particular physical structure, such as specific circuitry or

specific hardware components. I note that the Office Action states the same determination:

> The Camera Controller 114 is not disclosed as having any particular physical structure, except that it includes the various modules 116, 118, 126, and 128, which modules are also not disclosed as having any particular physical structure. The specification of the Patent Under Reexamination has been reviewed, and it does not appear that the Camera Controller 114 includes a particular physical structure or arrangement that enables the camera controller to execute the claimed functions.

Office Action at 7. I agree with this determination in the Office Action.

14. The '291 patent specification does not describe that the terms "controller" or "camera controller" are used according to any preexisting meanings outside of the '291 patent. The only other uses of the word "controller" in the specification are in the Summary section and Abstract, which only summarize at a high level essentially the same content as the "camera controller" element of claim 1, plus two mentions of "the camera controller" later in the written description after the introduction of "camera controller 114" that discuss some functionality relating to "the camera controller." '291 Patent, Abstract, 4:32-57, 5:21-33, 7:41-45, 7:62-64.

15. Based on the specification's teachings, a POSITA would have understood the "camera fusion processing core," also labeled by the patent as "controller" and "Camera Controller 114," to be a label for a collection of functions. A POSITA would have understood that the terms "controller" and "camera controller" are used in the '291 patent in an idiosyncratic way to denote a collection of functions rather than a specific structure.

16. For these reasons, I disagree with the opinion in the Supplemental Hart Declaration that claim 1 of the '291 patent uses the term "camera controller" to refer to a particular structure or class of structures. Supplemental Hart Declaration, ¶¶ 5-19. For example, the Supplemental Hart Declaration states the following opinions:

> A 'camera controller' [sic] one or more components (including software and/or hardware) within a system that are responsible for communicating information between a camera and other components in the system being controlled.

Supplemental Hart Declaration, ¶ 5.

> The class of structures corresponding to a 'camera controller' would be known to a POSITA as including hardware and/or software specifically designed to be connected to, and transmit and receive information from, cameras. These are well-known structures in the art and were well known to a POSITA at the time of the patent.

Supplemental Hart Declaration, ¶ 7.

> Thus, a 'camera controller' is a structural element, and a POSITA would understand this claim term to refer to structure. The term 'controller,' likewise, is a structural element that any POSITA would understand to be component of a system that is used to control a connected component or peripheral device within the system. Neither 'controller' nor, more importantly, 'camera controller' are nonce terms which serve as merely written constructs or placeholders to a POSITA, which is demonstrated in both technical literature and engineering dictionaries that define, discuss, and refer to 'controllers" as a specific structure within a system that has other components to be controlled.

Supplemental Hart Declaration, ¶ 8. The declaration also cites several third-party sources that have no apparent relationship to the '291 patent. Supplemental Hart Declaration, ¶¶ 9-15.

17. In my opinion, these assertions and opinions in the Supplemental Hart Declaration do not correctly address the meaning of "camera controller" in the '291 patent. These opinions and assertions ignore the fact that the '291 patent specification specifically introduces and uses the terms "controller" and "camera controller" in an idiosyncratic way, as discussed previously: "Camera 100 further comprises **a camera fusion processing core (also referred to as 'controller') 114** . . .." '291 Patent, 6:10-15 (emphasis added).

18. I further note that, even if one were to assume for purposes of analysis a preexisting structural meaning of the terms "controller" and/or "camera controller" such as reflected in the third-party materials cited in the Supplemental Hart Declaration, those preexisting structural meanings would not recite sufficient structure for performing the function of the "camera controller" element in claim 1 of the '291 patent. The function recited in claim 1 associated with the "camera controller" is: "to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view and to provide without fusion continuous zoom video mode output images of the object or scene, each output image having a respective output resolution; wherein the video output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value

or vice versa, wherein at the lower ZF value the output resolution is determined by the Wide sensor, and wherein at the higher ZF value the output resolution is determined by the Tele sensor."

19. I note that the Office Action identifies the same function. Office Action at 5-6.

20. The Supplemental Hart Declaration identifies only the following language as the function of the "camera controller" claim element: "to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view and to provide without fusion continuous zoom video mode output images of the object or scene, each output image having a respective output resolution." Supplemental Hart Declaration, ¶ 20. In my opinion, that identification of function is incomplete because it does not include the additional functionality recited to be performed by the "camera controller" element. For example, the "camera controller" function includes "video mode output images" and also includes further limitations on "the video output images" which are not captured by the incomplete identification of the function in the Supplemental Hart Declaration: "wherein the video output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa, wherein at the lower ZF value the output resolution is determined by the Wide sensor, and wherein at the higher ZF value the output resolution is determined by the Tele sensor."

21. Whether considering the complete function I identity or the incomplete portion of the function identified by the Supplemental Hart Declaration, either way, the recited function is specific to the purported invention claimed in the '291 patent, involving fusion of Wide and Tele image data in still mode and continuous zoom output images without fusion in video mode. This is not a standard function that is routinely present in every digital camera. A POSITA would have understood that a generic off-the-shelf "controller" or "camera controller," by itself, would not be capable of performing the specific function required by the "camera controller" in claim 1 of the '291 patent. The additional recitation that the "camera controller" is "operatively coupled to the Wide and Tele imaging sections" also would not be understood to provide sufficient structure for performing the recited function. Additional specific programming and configuration would be required in order to achieve the specific function recited in claim 1 involving fusion of Wide and

Tele image data in still mode and continuous zoom output images without fusion in video mode.

22. The third-party sources cited in the Supplemental Hart Declaration further confirm my opinion that the language of "controller," "camera controller," and/or "camera controller operatively coupled to the Wide and Tele imaging sections" would not have been understood by a POSITA to connote sufficient structure for performing the function recited in claim 1. None of the citations describes that a "controller" or "camera controller" performs this particular function (involving fusion of Wide and Tele image data in still mode and continuous zoom output images without fusion in video mode that provides a smooth transition) or anything remotely approaching this particular function. *See* Supplemental Hart Declaration, ¶¶ 9-15. For example, none of the cited excerpts from third-party sources discusses that a controller or camera controller performs fusion or combines Wide and Tele image data, or operates in both a still mode and a video mode. *See id*.

23. Thus, even if one were to ignore the teachings of the '291 patent specification and consider in isolation the language of "camera controller" or "camera controller operatively coupled to the Wide and Tele imaging sections" as proposed by the Supplemental Hart Declaration, a POSITA still would have understood that the "camera controller" element recites function without reciting sufficient structure for performing that function.

24. For these reasons, according to the legal standards that have been provided to me, it is my opinion that the "camera controller" element would be understood by a POSITA to be a means-plus-function element. I note that the Office Action reached this same determination. Office Action at 5-6. I agree with the Office Action in that regard.

III. EVALUATION OF CORRESPONDING STRUCTURE IN THE SPECIFICATION

25. As noted previously, the recited function for the "camera controller" element is "to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view and to provide without fusion continuous zoom video mode output images of the object or scene, each output image having a respective output resolution, wherein the video output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa,

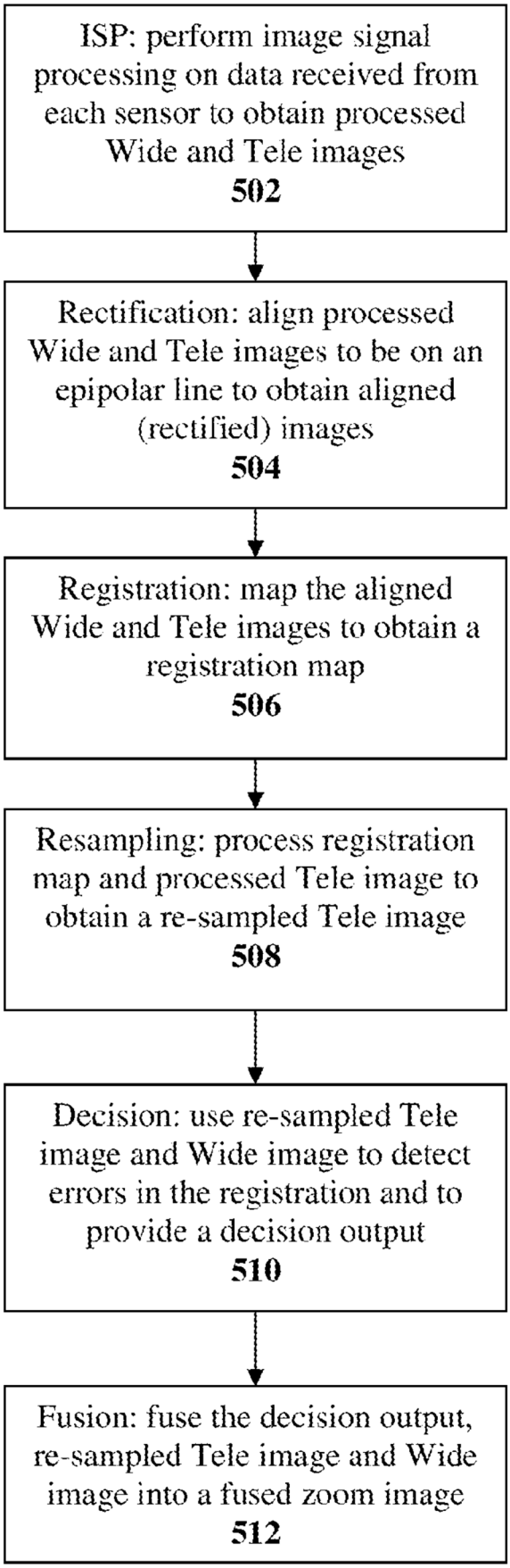
wherein at the lower ZF value the output resolution is determined by the Wide sensor, and wherein at the higher ZF value the output resolution is determined by the Tele sensor."

26. As noted previously, the '291 patent specification does not describe that the camera fusion processing core (labeled "camera controller 114") and its internal functional components have any particular physical structure. A POSITA would have understood that these descriptions are essentially placeholders for functions to be performed by a processing or computing device. In order for the specific function to be performed corresponding with the "camera controller" element of claim 1, specific algorithms for achieving each function would need to be provided for execution by a processing or computing device.

27. I note that the Office Action states: "As best understood, the Camera Controller 114 corresponds to a generic computing device that is specially programmed with algorithms so as to execute image processing operations on captured video and still images." Office Action at 7-8. I generally concur with this assessment.

28. Column 6, lines 10-36 references the overall camera fusion processing core (labeled "camera controller 114") including its functional subcomponent modules 116, 118, 126, and 128. '291 Patent, 6:10-36. While this description is associated with the "camera controller" element of claim 1, it does not describe performance of the specific function recited for the "camera controller" element of claim 1. Additional description of algorithmic steps for performing that function would be needed in order to provide corresponding disclosure for that recited function.

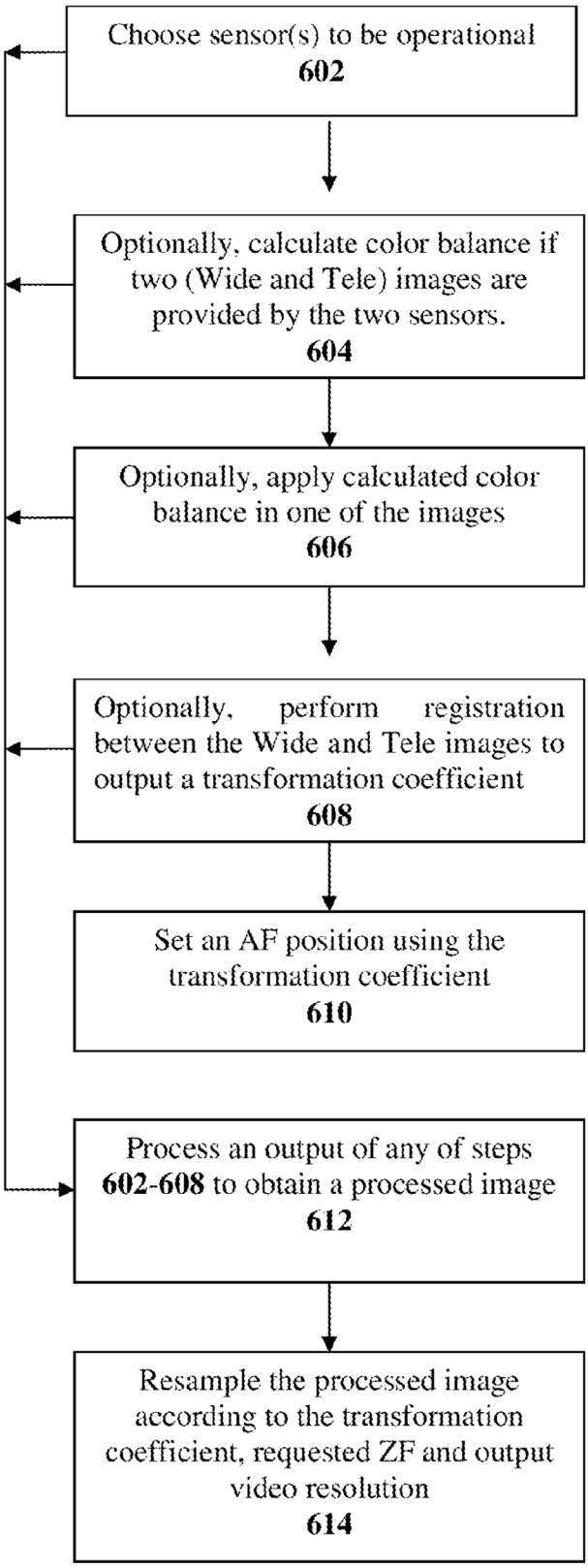
29. The claimed function for the claimed "camera controller" can be considered in two parts. The first portion of the claimed "camera controller" function is: "to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view." This portion, relating to combining Wide and Tele images to obtain fused output images in "still mode," corresponds with steps 504-512 shown in Figure 5 of the '291 patent and described in the corresponding text. Figure 5 is reproduced below.


ISP: perform image signal processing on data received from each sensor to obtain processed Wide and Tele images
502
Rectification: align processed Wide and Tele images to be on an epipolar line to obtain aligned (rectified) images
504
Registration: map the aligned Wide and Tele images to obtain a registration map
506
Resampling: process registration map and processed Tele image to obtain a re-sampled Tele image
508
Decision: use re-sampled Tele image and Wide image to detect errors in the registration and to provide a decision output
510
Fusion: fuse the decision output, re-sampled Tele image and Wide image into a fused zoom image
512

30. Figure 5 describes steps for obtaining a fused output image in still mode. First (step 502), Figure 5 describes processing images from the Wide and Tele image sensors by their respective Wide and Tele image signal processors (ISPs) – processes such as "denoising, demosaicing, sharpening, scaling, etc. as known in the art" – to obtain processed Wide and Tele images. '291 Patent, 9:16-20. These processing steps are common steps performed by ISPs, and would not be understood by a POSITA as processes performed by the claimed "camera controller" for obtaining a fused output image. Figure 5 then describes steps 504-512 for obtaining a fused output image: aligning the Wide and Tele images ("Rectification" step 504), mapping the aligned Wide and Tele images to obtain a registration map ("Registration" step 506), processing the registration map and processed Tele image to obtain a re-sampled Tele image ("Resampling" step 508), using the re-sampled Tele and Wide image to detect errors in the registration and provide a decision output ("Decision" step 510), and fusing the decision output, re-sampled Tele image and Wide image into a fused zoom image ("Fusion" step 512). '291 Patent, Fig. 5, 5:53-54. The text of the '291 patent specification provides further detailed description of these steps. '291 Patent, 9:15-44. The text also indicates that steps 504-512 are performed in "capture processing core 128," which refers to the "still processing" module 128 shown as part of the camera controller 114 functional block in Figure 1A. '291 Patent, 9:20-21, Fig. 1A, 6:31-32. Steps 504-512 correspond with the initial "still mode" portion of the "camera controller" element function: "to combine in still mode at least some of the Wide and Tele image data to provide a fused output image of the object or scene from a particular point of view . . . ."

31. The remainder of the claimed "camera controller" function is: "to provide without fusion continuous zoom video mode output images of the object or scene, each output image having a respective output resolution, wherein the video output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa, wherein at the lower ZF value the output resolution is determined by the Wide sensor, and wherein at the higher ZF value the output resolution is determined by the Tele sensor." This latter portion of the claimed "camera controller" function in claim 1, relating to providing "continuous zoom video mode" that is performed "without fusion" corresponds with the steps shown in Figure

6 of the '291 patent and described in the corresponding text. Figure 6 is reproduced below.



32. Figure 6 describes steps for capturing a continuous zoom output image in video mode, including choosing sensor(s) to be operational (step 602), calculate color balance if Wide and Tele images are provided by two sensors (step 604), apply the calculated color balance in one of the images (step 606), perform registration between the Wide and Tele images to output a transformation coefficient (step 608), set an autofocus (AF) position using the transformation coefficient (step 610), process an output of any of steps 602-608 to obtain a processed image (step 612), and resample the processed image according to the transformation coefficient, requested zoom factor (ZF), and output video resolution (step 614). '291 Patent, Fig. 6, 5:55-56. The text of the '291 patent specification provides further detailed description of these steps. '291 Patent, 11:6-12:11. The specification provides that in order for the steps to provide a "smooth continuous zoom experience," when selecting which camera to use in Step 602, the camera will use one switching point – $\Delta Zoom_{up}$ – when zooming in, and another switching point – $\Delta Zoom_{down}$ – when zooming out, which "will result in transition between the sensors to be performed at different zoom factor ('hysteresis') when zoom-in is used and zoom-out is used." '291 Patent, 6:11-21, 12:3-11 (explaining that setting $\Delta Zoom_{up}$ to be different from $\Delta Zoom_{down}$ provides "smooth continuous zoom experience"). I note that no fusion step is included in the steps of Figure 6. The text indicates that step 602 is performed in "sensor control" module 116 and steps 604-614 are performed in "video processing" module 126, both of which modules are within the camera controller 114 functional block shown in Figure 1A. '291 Patent, 11:12-23, Fig. 1A, 6:12-14. The steps 602-614 in Figure 6 correspond with the following portion of the "camera controller" function in claim 1: ". . . to provide without fusion continuous zoom video mode output images of the object or scene, each output image having a respective output resolution, wherein the video output images are provided with a smooth transition when switching between a lower zoom factor (ZF) value and a higher ZF value or vice versa, wherein at the lower ZF value the output resolution is determined by the Wide sensor, and wherein at the higher ZF value the output resolution is determined by the Tele sensor."

33. I note that the Office Action determines that the corresponding structure for the

"camera controller" function is "the disclosed algorithms for executing the claimed functions: FIG. 5 (still mode – steps 504-512) and FIG. 6 (video mode)." Office Action at 8. I concur with this assessment.

34. The Office Action further states: "Notably, the algorithm in FIG. 6 is characterized by setting the $\Delta Zoom_{up}$ and $\Delta Zoom_{down}$ parameters to be different so that the transition between the Wide and Tele sensors is performed at different zoom factors (ZFs) when zooming in or zooming out. This hysteresis phenomenon results in smooth continuous zoom experience when in video mode (see Patent Under Reexamination at 11:6 – 12:11)." Office Action at 8; *see also id.* at 16 (distinguishing the cited Golan and Parulski references on the basis that "[n]either . . . appears to disclose this hysteresis feature"). I concur that the disclosed structure corresponding to the "continuous zoom video mode" function for the "camera controller" of claim 1 requires use of hysteresis, as I previously explained. *See*, *e.g.*, '291 Patent, 11:37-40, 11:65-12:11.

35. The Supplemental Hart Declaration indicates that if the "camera controller" element is construed as a means-plus-function element, then the corresponding structure is "any of the following: '291 patent, at 6:10-36; 9:15-44; 11:6-12:2, FIG. 1A (object 114), FIG. 5, FIG. 6." Supplemental Hart Declaration, page 2; *see also id.*, ¶ 20 (stating "any combination of the numerous disclosures in the specification discussing those aspects of the invention, which includes '291 patent, at 6:10-36; 9:15-44; 11:6-12:2, FIG. 1A (object 114), FIG. 5, and FIG. 6.").

36. These positions in the Supplemental Hart Declaration align to some extent with my own opinions, but they are not precisely correct, in my opinion. I agree that the steps shown in Figures 5 and 6 and the text at columns 9:20-36 and 11:6-12:2 correspond with the function of the "camera controller" element in claim 1. I also do not dispute that the description of the "camera controller 114" at column 6, lines 10-36 and in Figure 1A generally corresponds to the "camera controller" element in claim 1, though these high-level descriptions do not specifically describe the performance of the function recited in claim 1, as discussed previously.

37. In my opinion, however, the Supplemental Hart Declaration is incorrect in identifying "any of" or "any combination of" the identified structures as the corresponding structure for the "camera controller" function of claim 1. As discussed previously, the function recited in

claim 1 includes both the "still mode" with combining of Wide and Tele image data to create a fused output image and the "video mode" with continuous zoom without fusion. Based on the legal instructions provided to me, the corresponding structure therefore needs to include structure corresponding to the complete recited function, not merely an incomplete portion of the recited function. The structure therefore needs to include both the "still mode" disclosures of Figure 5 and its associated text (column 9:15-36) and the "video mode" disclosures of Figure 6 and its associated text (column 11:6-12:2). I agree with the Office Action in this regard, as noted previously.

38. Dr. Hart also identifies column 9:37-44 as disclosing structure for the claimed "camera controller." I agree that these disclosures to apply to the claimed still mode fusion function, as 9:37-44 describe an optional way of performing the steps 506-512. However, I disagree to the extent Dr. Hart is stating that this disclosure eliminates the need to perform steps 504-512.

39. Dr. Hart also identifies column 6:10-36, in which the specification describes that the "controller" includes certain modules (i.e., "a sensor control module 116, a user control module 118, a video processing module 126 and a capture processing module 128"). However, the video processing module 126 and capture processing module 128 (also called the "Still processing module 128") do not, on their own provide sufficient structure for performing the claimed "camera controller" functions (including still mode fusion and continuous zoom video mode). '291 Patent, 6:19-36. These modules are merely described functionally as modules that capture still and video images, without any disclosure of algorithmic structures for performing the claimed function recited in claim 1. Therefore, the algorithmic disclosures of Figure 5 and Figure 6 and their associated text are also required structure, as I have previously described.

40. Finally, I disagree with Dr. Hart's identification of the disclosures at column 9:15-19 regarding step 502. In my opinion, this disclosure regarding step 502 does not specifically correspond to recited function for the "camera controller," for the reasons discussed previously. I note that the Office Action also did not include step 502 in its identification of the corresponding structure. Office Action at 8.

I declare under penalty of perjury that the foregoing is true and correct to be best of my knowledge. Executed on August 6, 2023.

Fredo Durand

Frédo Durand